CITY OF IMPERIAL BEACH

BUILDING DIVISION
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BUILDING DIVISION BULLETIN FOR REPLACEMENT OF SPACE CONDITIONING EQUIPMENT FOR EXISTING LOW-RISE RESIDENTIAL

The City of Imperial Beach is located in climate zone 7, which requires replacement of existing space conditioning equipment comply with the following excerpts of the 2008 California Energy Commission Handbook (CECH) and the California Energy Code (CEC). Please note that items not applicable in climate zone 7 are noted as such and code language not provided.

CEC HANDBOOK 8.4.1 Mandatory Requirements per CEC §152(b) 1§152(b)2

Any altered components of the heating and cooling system must meet the same mandatory requirements that apply to new construction. These mandatory requirements include the following as appropriate:

1. Equipment efficiency (enforced at time of sale) Heat pump controls

   Verified by local Building Departments

2. Heating and cooling load calculations

   CEC Chapter 9 Low-Rise Residential Buildings-additions and alterations to existing Residential Buildings
   CEC Section 152(b) 1 C New and replacement space-conditioning systems shall:
   i. Meet the requirements of section 150(h), 150(i), 150(j)2, 151(f)6, 151(f)7, 151(f)9 and 151(f)11; and
   ii. Be limited to natural gas, liquefied petroleum gas or the existing fuel type unless it can be demonstrated that the TDV energy use of the new system is more efficient than the existing system.

   CEC HANDBOOK 4.2.1Equipment Sizing per CEC §150(h)
   The Standards do not set limits on the sizing of heating equipment, but they do require that heating loads be calculated for new heating systems. Oversized equipment typically operates less efficiently and can create comfort problems due to excessive cycling and high airflow.

   Acceptable load calculation procedures include methods described in the ASHRAE Handbook – Equipment, ASHRAE Handbook – Applications, ASHRAE Handbook – Fundamentals, SMACNA Residential Comfort System Installation Manual, or ACCA Manual J.

   The Standards require that the outdoor design conditions for load calculations be selected from Joint Appendix II, and that the indoor design temperature for heating load calculations be 70 ºF. The outdoor design temperature must be no lower than the heating winter median of extremes as listed in the Joint Appendix. If the actual city location for a project is not included in the Joint Appendix, or if the data given for a particular city does not match the conditions at the actual site as well as that given for another nearby city, consult the local building department for guidance.

   The minimum size of residential heating systems is regulated by the California Building Code (CBC), Section 310.11. The CBC requires that the heating system be capable of maintaining a temperature of 68° F at a distance three feet above the floor throughout the conditioned space of the building.
   The load calculations must be submitted with compliance documentation when requested by the building department. The load calculations may be prepared by 1) the documentation author and

submitted to the mechanical contractor, 2) a mechanical engineer, or 3) the mechanical contractor who is installing the equipment.

3. Standby losses and pilot lights

CEC HANDBOOK 4.2.1 Standby Losses and Pilot Lights per CEC *§115 §112(c)*
Fan-type central furnaces may not have a continuously burning pilot light. This requirement does not apply to wall furnaces, floor furnaces or any gravity type furnace. Household cooking appliances also must not have a continuously burning pilot light except for those without an electrical supply voltage connection and in which each pilot consumes less than 150 Btu/hr. *§112(c)*
Larger gas-fired and oil-fired forced air furnaces with input ratings ~ 225,000 Btu/h (which is bigger than a typical residential furnace) must also have an intermittent ignition or interrupted device (IID), and either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. All furnaces with input ratings ~ 225,000 Btu/h, including electric furnaces, that are not located within the conditioned space must have jacket losses not exceeding 0.75% of the input rating.

4. Pipe insulation and refrigerant line insulation

CEC HANDBOOK Insulation for Refrigerant Lines in Split System Air Conditioners per CEC §150(j)2,§150(m)9
Refrigerant lines connecting the indoor and outdoor units of split system air conditioners and heat pumps: the liquid line (the smaller line) and the larger suction (cooling) line. The liquid line is at an elevated temperature, and heat escaping from it is helpful; therefore, it should not be insulated. However, the suction line carries refrigerant vapor that is cooler than ambient in the summer and (with heat pumps) warmer than ambient in the winter. This line, less than or equal to 2 in. in diameter, must be insulated with at least 0.75 in. of insulation per the requirements of §150 (j) 2.

5. Minimum duct insulation

CEC Chapter 9 Low-Rise Residential Buildings-additions and alterations to existing Residential Buildings
CEC Section 152(b) 1 D When more than 40 feet of new or replacement space-conditioning ducts are installed in unconditioned space, the new ducts shall meet the requirements of section 150(m) and the duct insulation requirements of package “D”, section 151(f)10.

Package “D” requires Minimum = R-4.2for climate zone 7

Also see installation minimum requirements per CECH connection and closures below for new ducts.

CECH 4.4.1 Mandatory Measures

Minimum Insulation per CEC§150(m)1, §150(m)5
In all cases, unless ducts are enclosed entirely in conditioned space, the minimum allowed duct insulation value is R-4.2. Note that higher values may be required by the prescriptive requirements as described below. For the purpose of determining installed R-value of duct wrap, the installed thickness of insulation must be assumed to be 75 % of the nominal thickness due to compression.

6. Duct connections and closures

CECH 4.4.1 Mandatory Measures
Connections and Closures §150(m)1, §150(m)2, §150(m)3

The Standards set a number of mandatory measures related to duct connections and closures. These measures address both the materials used for duct sealing and the methods that may be used. Refer to the sections of the Standards listed above for details.

Connections between metal ducts and the inner core of flexible ducts must be mechanically fastened.

Openings must be sealed with mastic, tape, or other duct closure systems that meet the applicable requirements of UL 181, UL 181A, UL 181B or with aerosol sealant systems that meet the requirements of UL 723.

If mastic or tape is used to seal openings greater than 1/4 in., the combination of mastic and either mesh or tape must be used.

Building spaces such as cavities between walls, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board, or flexible duct must not be used for conveying conditioned air including return air and supply air. The practice of using drywall materials as the interior surface of a return plenum is not allowed. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms must not be compressed to cause reductions in the cross sectional area of the ducts. Although a HERS rater may examine this as a part of his or her responsibilities when involved in a project, the enforcement of these minimum standards for ducts is the responsibility of the building official.

CECH Duct Installation Standards

The mandatory duct construction measures referenced earlier state that duct installations must comply with California Mechanical Code Sections 601, 602, 603, 604, 605, and Standard 6-5, as well as the requirements of Title 24. Some of the highlights of these requirements are listed in this section along with some guidance on good construction practice.

Tapes and Clamps

- All tapes and clamps must meet the requirements of Section 150 (m) of the Standards.

- Cloth-back rubber-adhesive tapes must be used only in combination with mastic.

All joints must be mechanically fastened

- For residential round metal ducts, installers must overlap the joint by at least 1½ in. and use three sheet metal screws equally spaced around the joint (see Figure 4-6).

- For round non-metallic flex ducts, installers must insert the core over the metal collar or fitting by at least 1 in. This connectionmay be completed with either mesh, mastic and a clamp, or two wraps of tape and a clamp.

- For the mesh and mastic connection, the installer must first tighten the clamp over the overlapping section of the core, apply a coat of mastic covering both the metal collar and the core by at least 1 in., then firmly press the fiber mesh into the mastic and cover with a second coat of mastic over the fiber mesh (see Figure 4-7).

- For the tape connection first apply at least two wraps of tape covering both the core and the metal collar by at least 1 in., then tighten the clamp over the overlapping section of the core (see Figure 4-8).

All joints must be made airtight in accordance to §150 (m)

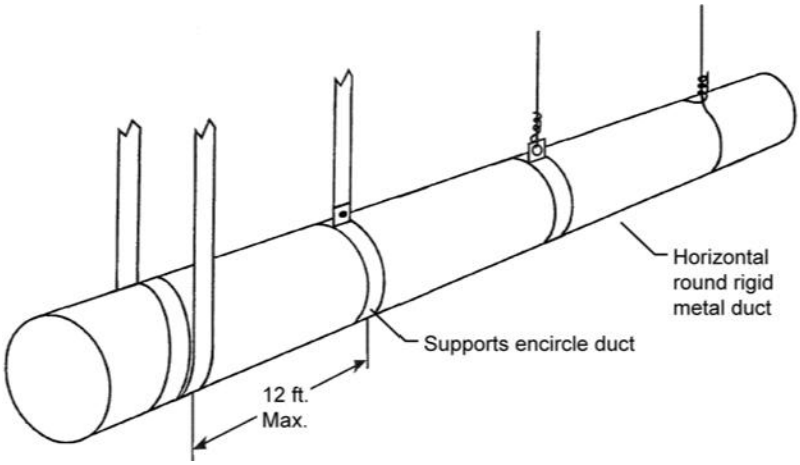
- Seal with mastic, tape, aerosol sealant, or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, UL 181B, or UL 723. Duct systems shall not use cloth-back, rubber-adhesive duct tape regardless of UL designation, unless it is installed in combination with mastic and clamps. The Energy Commission has approved a cloth-back duct tape with a special butyl adhesive manufactured by Tyco and sold as Polyken 558CA or Nashua 558CA. This tape passed Lawrence Berkeley Laboratory tests comparable to those that cloth-back rubber-adhesive duct tapes failed. The Tyco tape is allowed to be used to seal flex duct to fittings without being in

combination with mastic. This tape cannot be used to seal other duct system joints, such as the attachment of fittings to plenums and junction boxes. It has on its backing the phrase "CEC approved," a drawing of a fitting to plenum joint in a red circle with a slash through it (the international symbol of prohibition), and a statement that it can not be used to seal fitting to plenum and junction box joints.

- Mastic and mesh should be used where round or oval ducts join flat or round plenums (see Figure 4-9).

All ducts must be adequately supported

- Both rigid duct and flex duct may be supported on rigid building materials between ceiling joists or on ceiling joists.
- For rigid round metal ducts that are suspended from above, hangers must occur 12 ft apart or less (see Figure 4-10).



- For rectangular metal ducts that are suspended from above, hangers must occur at a minimum of 4 ft to 10 ft depending on the size of the ducts (see Table 6-2-A in the California Mechanical Code). Refer to Figure 4-11.
- For flex ducts that are suspended from above, hangers must occur at 4 ft apart or less and all fittings and accessories must be supported separately by hangers (see Figure 4-12).
- For vertical runs of flex duct, support must occur at 6 ft intervals or less (see Figure 4-13).
- The routing and length of all duct systems can have serious impacts on system performance due to possible increased air flow resistance. The Energy Commission recommends using the minimum length of duct to make connections and the minimum possible number of turns.
- For flexible duct, the Energy Commission recommends fully extending the duct by pulling the duct tight and cutting off any excess duct and avoiding bending ducts across sharp corners or compressing them to fit between framing members (see Figure 4-14). Also avoid incidental contact with metal fixtures, pipes, or conduits or installation of the duct near hot equipment such as furnaces, boilers, or steam pipes that are above the recommended flexible duct use temperature.
- All joints between two sections of duct must be mechanically fastened and substantially airtight. For flex duct this must consist of a metal sleeve no less than 4 in. in length between the two sections of flex duct.
- All joints must be properly insulated. For flex ducts this must consist of pulling the insulation and jacket back over the joint and using a clamp or two wraps of tape.

- Aerosol sealant injection systems are an alternative that typically combines duct testing and duct sealing in one process. Figure 4-15 shows the computer-controlled injection fan temporarily connected to the supply duct. The plenum is blocked off by sheet metal to prevent sealant from entering the furnace. Supply air registers are also blocked temporarily to keep the sealant out of the house. Note that ducts must still be mechanically fastened even if an aerosol sealant system is used.

CECH Duct Sealing and Insulation per CEC §152(b)1D &§152(b)1E, §150(m)2D, §150(m)3D

Not required for climate zone 7

Duct systems may not use cloth-back, rubber-adhesive duct tape unless it is installed in combination with mastic and draw bands. The enforcement of these minimum standards is the responsibility of the building official.

7. Product markings for flexible ducts

Product Markings per CEC §150(m)6
Insulated flexible duct products installed to meet this requirement must include labels, in maximum intervals of three feet, showing the R-value for the duct insulation (excluding air films, vapor barriers, or other duct components), based on the tests and thickness specified in § 150(m).

8. Dampers to prevent air leakage

Dampers to Prevent Air Leakage per CEC §150(m)7,§150(m)8
Fan systems that exhaust air from the building to the outside must be provided with back draft or automatic dampers. Gravity ventilating systems must have an automatic or readily accessible, manually-operated damper in all openings to the outside, except combustion inlet and outlet air openings and elevator shaft vents. This includes clothes dryer exhaust vents when installed in conditioned space.

9. Protection of insulation

Protection of Insulation per CEC §150(m)9
Insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind but not limited to the following: Insulation exposed to weather must be suitable for outdoor service e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

10. Setback thermostat (in most cases)

CECH 4.5.1 Setback Thermostats per CEC *§151(f) 9*
Automatic setback thermostats can add both comfort and convenience to a home. Occupants can wake up to a warm house in the winter and come home to a cool house in the summer without using unnecessary energy. A setback thermostat is always required for central systems whether the prescriptive or performance compliance method is used. An exception is allowed only if: (1) the building complied using a computer performance approach with anon-setback thermostat; and (2) the system is one of the following non-central types:

- Non-central electric heaters, Room air conditioners, Room air conditioner heat pumps, Gravity gas wall heaters, Gravity floor heaters, Gravity room heaters, Room air conditioners.

When it is required, the setback thermostat must have a clock or other mechanism that allows the building occupant to schedule the heating and/or cooling setpoint temperature over a 24-hour period. The setback thermostat must be designed so that the building occupant can program different temperature settings for at least two different time periods each day, for example, 68°F during morning hours, 60°F during the day, 68°F during evening hours, and 60°F at night.

11. Fireplaces, decorative gas appliances, & logs (infiltration & pilot light requirements)

CEC section 150 Installation of fireplaces, decorative gas appliances and gas logs.

- New installed fireplaces require glass doors covering the entire opening of the fire box. Combustion air is required from the outside 6 square inches minimum unless fireplace is located on the exterior wall and on a concrete slab. Air must be readily accessible and with tight fitting damper or combustion-air-control device. A flue damper control must be readily accessible.
- Continous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.

City of Imperial Beach required information for permitting of replacement space conditioning equipment. in low-rise residential per CEC

A. Provide equipment sizing calculations per item 2 above. Attach to Application

B. Provide equipment Annual Fuel Utilization Efficiency (AFUE), Energy Efficiency Rating (EER) Seasonal Energy Efficiency Rating (SEER) information as applicable and Energy Commission certification information per item 1 above. Attach to Application

C. Indicate # of feet of duct replaced (if over 40') or new duct installations, items in 5 and 6 above apply. # of fee of replacement duct proposed _____

D. Attach Imperial Beach Mandatory Measures Summary Check List: check all applicable items for the designer for your proposed installation, not already checked.